TITLE: STATISTICAL OPTIMIZATION OF MANNOSYLERYTHRITOL LIPIDS BIOSURFACTANTS PRODUCTION BY *PSEUDOZYMA APHIDIS* UFMG-Y3468 THROUGH CENTRAL COMPOSITE DESIGN

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ABSTRACT

Yeasts from *Ustilaginaceae* family are known as potential producers of value-added compounds, including biosurfactants. The production of mannosylerythritol lipids (MELs) and other derivatives by *Pseudozyma* sp. strains can be considered an important approach in biotechnology due to physico-chemical properties, low toxicity and biodegradable characteristics these compounds and its potential applications in food, environmental and cosmetic fields. At this study, the biosurfactant producer (UFMG-Y3468) used was a *P. aphidis* strain isolated from natural environment and four independent variables (*k*) were evaluated, including different concentrations of hydrophobic carbon source (soybean oil, X_1) and hydrophilic carbon source (glucose, X_2) organic nitrogen source (yeast extract, X_3) and inorganic nitrogen source ($NaNO_3$, X_4). In order to optimize the bioprocess of MEL production was performed a 2^4 central composite design (CCD), based in $2^k+k*2+4$ assays, comprising 28 experiments. The dependent variable (*Y*) used was the concentration of crude extract (Y_1) after 216 hours of process. In addition, the chemical characterization of MEL isoforms was performed using UHPLC-ESI-MS/MS analysis. The final step was the elaboration of predictive mathematical models considering the statistically significant variables and analysis of variance (ANOVA), as well as the coefficients of determination (R^2) and the F values calculated with the Fisher test. As main results, the maximum concentration of crude extract of MEL obtained was around 17.6 g/L, with seven statistically significant coefficients of regression ($p < 0.10$). After analysis of variance (ANOVA), a percentage of variation explained around 80% and a value of F calculated 6 times higher than the table value was obtained. Considering these results, was obtained a predictive mathematical model: $Y = 17.331+4.485X_1-0.297X_2+1.806X_3-2.243X_1^2-1.588X_2^2+2.070X_1X_3+1.913X_2X_4$, able to predict the best conditions (concentrations of nitrogen and carbon sources) for maximize the concentration of biosurfactant produced. The optimum conditions were verified from the construction of the response surfaces and contour curves, demonstrating that the optimal concentrations for the production would be around 40 g / L glucose, 55 g / L soybean oil, 5 g / L of yeast extract. Therefore, the used of experimental design for statistical optimization of the production of microbial metabolites of industrial interest can be considered an interesting tool in biotechnology.

Keywords: Biosurfactant; Mannosylerythritol lipids; *Pseudozyma aphidis*; Optimization; Glycolipids

Development Agencies: CNPq